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Specific mass shift measurements in radioactive Rb isotopes by Doppler-free two-photon transitions[1] TAO KONG, T. WIEBE, A. CHATWIN-DAVIES, A. BERMAN, A. GORELOV, M. PEARSON, J. BEHR, TRIUMF, CANADA, S. BEHLING, Texas A&M Univ., G. GWINNER, Univ. of Manitoba —
For an exotic particle search involving the decay of laser trapped Rb nuclear isomers, the fast-moving decay daughters must be photo-ionized to measure their momentum. Doppler-free two-photon $5S_{1/2}$ to $5D_{5/2}$ transition is used to selectively photo-ionize the daughter isotopes. We have measured the $5D_{5/2}$ state hyperfine structure and isotope shifts of ^{86m}Rb, ^{86g}Rb and ^{81g}Rb, with accuracy between 0.1 $\sim$ 0.9 MHz. Systematic errors have been investigated offline on ^{87}Rb under the same experimental conditions, and the dominant effect is a Zeeman shift $\sim$ 0.2 MHz. The specific mass shift difference between $S_{1/2}$ to $P_{3/2}$ transition and $S_{1/2}$ to $D_{5/2}$ transition in those isotopes is deduced by making a King Plot, which also utilized isotope shift data measured by other groups [F. Nez, Optics Communications, 1993][C. Thibault, PRC, 1981]. Tests of time changes of fine structure constant α need isotope shifts of alkali-like species [Berengut, PRA, 2003].

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